

~1965

# UTICA COMMUNICATIONS CORP.

## Instruction Manual



**MODEL UTICA "650"  
V650**

**6 METER TRANSCEIVER WITH VFO**



UTICA Model "650"

AMATEUR 6 METER TRANSMITTER-RECEIVER

OPERATION & TECHNICAL MANUAL

The Utica six meter amateur transmitter-receiver is designed and manufactured to exacting standards. The inherent features are accomplished by utilizing the latest techniques developed within the state-of-the-art. This engineering practice, and the choice of high quality components are combined in the Model "650" to provide the amateur with endless hours of pleasure, and years of dependable service.

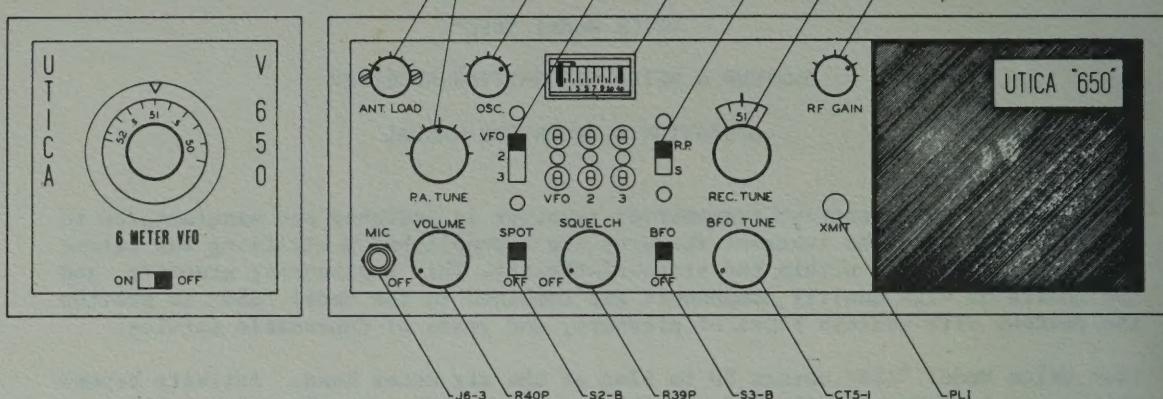
Your Utica Model "650" covers 50 to 52mc of the six meter band. Activity beyond this range is extremely limited, possibly caused by TVI and other commercial service interference. The "650" is a compact and complete VFO, transmitter, and receiver, equipped for fixed station operation from 115 V.A.C. 60 cycle, or mobile station operation from 12-15 volts D.C.

SPECIFICATIONS

RECEIVER

TRANSMITTER

1. Dual conversion superhetrodyne providing 13 tube performance over 50 to 52 mc. Temperature compensation is utilized in all oscillator circuits.
2. Sensitivity: Better than 0.5 microvolts for 6db S/N.
3. Selectivity: 3kc at 10db down.
4. I.F. Frequency: 10.6mc 1st;  
595kc 2nd.
5. Image Rejection: 44db (minimum).
6. Noise Suppression: Series gate, self adjusting.
7. Tuning: 3.5 to 1 planetary drive on 2 gang capacitor.
8. Audio output: 2.5 watts undistorted. 3.5 watts at 5%.
9. Signal meter: Illuminated and calibrated up to 40db over S-9.
10. Crystal controlled 1st local oscillator.
11. B.F.O. - Adjustable.
12. RF gain control (adjustable).
1. 3 stages, crystal controlled, or VFO.
2. High level plate and screen modulation.
3. Nominally rated at 22 watts input 100% modulated.
4. 2E26 final amp. operates as a straight thru Class "C" amp.
5. Pi network tank for matching 30 to 150 ohm antennae.
6. Built-in TVI filter.
7. Oscillator operates with 8.0mc or 25mc crystals.
8. Complete push-to-talk operation.
9. Spot switch for frequency correlation.
10. "S" meter switches for transmitter tuning and relative power indicator.
11. Spot - Transmit indicator.



### POWER SUPPLY

The "650" has a built in power supply for operation on 115 volts A.C. 60 cycle, or 12 volts D.C. from a car battery source. Selection is made by simply selecting the proper line cord for the service intended. The power supply is separately fused for either service.

### POWER RATINGS

115 V.A.C.      Receive: 50 watts  
60 cycle      Transmit: 105 watts

12 V.D.C.      Receive: 4.25 amps.  
Transmit: 8.2 amps.

### INSTALLATION

#### FIXED STATION:

Select the 115 volt A.C. power cord with the plug at one end. The black connector at the opposite end of this cord is attached to the power plug at the rear of Model "650". The antenna transmission line should be terminated by means of a PL259 coax connector, which is attached to the corresponding connector at the rear of the set. A six meter VFO or crystals may be plugged into the front panel positions marked VFO, 2, 3. The selector switch S4-1 is now placed in the position desired corresponding to the jack in use. The power cord is now attached to a 115 V.A.C. power line source, and the volume control is rotated clockwise to the "On" position. The Utica "650" is ready for fixed station operation.

#### MOBILE OPERATION

The mobile mounting brackets are attached to the sides of the UTICA "650" and the V-650 VFO cabinets. The 12 volt D.C. power cord is attached to the power connector at the rear of the set. The "650" and VFO should now be installed in a convenient location within the vehicle, to provide maximum accessibility for ease of operation. Attach antenna transmission line and VFO power cable to corresponding connectors in back of the "650"; connect power line clips to the 12 volt power source. Plug microphone into the front panel jack and rotate the volume control to the "On" position. The "650" is ready for mobile operation.

#### RECEIVER ADJUSTMENT & OPERATION:

Set the controls on the front panel as follows:

Volume:	Maximum clockwise
Spot Switch:	Off
Squelch:	Maximum counter-clockwise
BFO:	For AM—"Off"; For SB or CW—"On"
R.F. Gain:	Maximum clockwise

## RECEIVER ADJUSTMENT & OPERATION, cont.

The receiver is now in the operating mode. Approximately one minute after warmup an audible hiss will be evident from the speaker. Now adjust the volume control to a comfortable listening level and tune the dial slowly from 50 mc toward 52 mc. The reception of amateur stations will decrease the background noise; proper tuning will be indicated by maximum deflection of the "S" meter pointer. The signal strength of the station may be read in "S" units on the calibrated scale of the meter. For receiving code or CW signals, as well as double side band or single side band signals, the BFO is turned on, and the BFO tune control is rotated slowly for best reception. When the BFO is turned on, the AVC and noise limiter circuits are disabled. Strong signals will overload the receiver unless the R.F. Gain is decreased to a level where normal reception is attained. When a station is properly tuned in, and it is desired to monitor this station's transmissions for a period of time, the background noise may be reduced by use of the squelch control set properly during a stand - by period of the transmitting station as follows: Turn the squelch control in a "clockwise" direction until the background noise is no longer audible. When a station resumes transmission the signal will override the setting of the squelch control and reception will be normal, except for the background noise which will be inaudible. The setting of the squelch control will vary with the intensity of the stations received. Readjustment of the squelch control is necessary for each station of different signal levels.

## TRANSMITTER ADJUSTMENT & OPERATION:

Select the six meter VFO, or suitable crystals with frequencies in the range of 8.33 to 8.6 mc, or 25.05 to 26.0 mc. The transmitter output frequency will be six times the fundamental for 8 mc crystals, and two times the fundamental for 25 mc crystals. Set the transmitter controls on the front panel as follows:

Antenna Load:	Maximum clockwise
Oscillator Plate:	Mid position
P. A. Tune:	Approximately mid position
Selector Switch:	In corresponding position to jack used
Meter Switch:	"S" position
Spot Switch:	On

Plug the VFO power cord into the matching socket on the rear of the chassis. Plug the VFO output connector into the socket on the front panel. Please Note: one pin of the output connector has a red dot. This pin must go into the socket hole, so marked. If VFO is to be used, place the selector switch in the "VFO" position and place the VFO power switch in the "On" position.

After approximately one minute for warmup, tune the receiver dial until the six meter output of the crystal or VFO is received as indicated by maximum deflection of the "S" meter. Tune oscillator plate control for maximum indication. Place "S" meter switch in the "RP" position and turn the spot switch to the "Off" position. Press the push-to-talk switch on the side of the microphone to actuate the transmitter. Now tune the "PA Control" for maximum meter reading. If there is no effect in meter reading as the "PA Tune" is adjusted, slightly adjust L4-1 doubler core in either direction for max. reading. Then resume "PA Tune" control adjustment. Advance the antenna load control counter - clockwise and retune "PA Control" for maximum meter reading. Increase antenna loading control one dial division at a time, alternately adjusting the "PA Tune" control for maximum meter indication. Maximum meter reading indicates normal transmitter operation with an input of 22 watts to the final amplifier. The "Transmit" light on the front panel is used to indicate that the spot switch is "On" or that the transmitter is on the air.

## TRANSMITTER ADJUSTMENT & OPERATION, cont.

Recheck the foregoing procedure for proper adjustment of the transmitter. When properly loaded, speaking into the microphone will cause a slight upward deflection of the "S" meter, indicating that the speech and modulator is operating correctly.

The microphone is especially selected for its "close talking" and "voice range" characteristics, to reduce the possibility of transmitting background noise, caused by traffic, conversation, etc., within the operating vicinity. Thus, it is necessary to speak directly across the microphone, which should be held about one inch from the lips of the operator.

### CAUTIONS !!!

1. DO NOT PRESS "TRANSMIT" SWITCH WHILE THE "SPOT" SWITCH IS IN THE "ON" POSITION. TURN OFF SPOT SWITCH BEFORE TRANSMITTING!!
2. WHEN USING "VFO", PLUG IN OUTPUT CABLE WITH RED MARK ON PLUG ADJACENT TO RED MARK ON "VFO" SOCKET!!
3. DO NOT USE VFO SOCKET FOR CRYSTAL OPERATION!!
4. DO NOT OPERATE TRANSMITTER WITHOUT PROPER ANTENNA OR DUMMY LOAD IN THE OUTPUT CIRCUIT!!
5. KEEP TOP OF CABINET FREE OF METAL PARTS OR OTHER OBSTRUCTIONS TO PREVENT SHORTS AND RESTRICTION OF PROPER AIR CIRCULATION!!

### TRANSMITTER OUTPUT:

To check the transmitter for proper operation and power output without an antenna, a dummy load and output indicator may be used. The equipment shown in the sketch is designed for a 52 ohm transmission line. The resistor values may be changed to correspond to other antenna system impedances. The total rating of the resistor network must be 12 watts minimum. The unit shown can be built in prefabricated aluminum box, 3" x 5" x 4". A piece of RG-58U (or equivalent) coax cable, less than 2 feet long is wired into the box. The free end is terminated with a PL259 connector, for mating with the antenna socket on the transceiver.

With the transmitter warmed up, press the microphone switch and conduct the tuning procedure described in the "Transmitter Operation and Adjustment" section. When this has been accomplished, note the "S" meter reading and record for future reference. Now replace dummy load with antenna feed line. Recheck adjustments for same meter reading as recorded with the dummy load.

The transmitter is now prepared for operation on the 6 meter amateur band.

### TV INTERFERENCE:

The "650" is equipped with a built in low pass series resonant filter which has been pre-aligned at the factory to suppress interference on channels 2 to 6. In cases where the transmitting antenna is close to television receiving antennae, this filter may not be sufficiently effective. In some instances, the installation of a high pass filter between the antenna lead-in and TV chassis will prove effective. Specific interference on one TV channel may be eliminated by slight adjustment of the trap core in the chassis of the "650". (See schematic, T.V.). This is required only in severe conditions.

## THEORY OF OPERATION

### RECEIVER:

The dual conversion receiver consists of the following stages; a pretuned pentode RF amplifier with a total band pass of 50 to 52mc (approx.) is inductively coupled by two tuned circuits to the first pentode mixer tube. The first local oscillator is crystal controlled at 40mc. This signal is injected to the first mixer resulting in difference frequency output of 10 to 13mc (approx.). This frequency is applied to the input of the 2nd pentode mixer, which is tuned by the main receiver tuning capacitor. The tunable 2nd local oscillator is also controlled by the 2nd section of the tuning capacitor, except that the injection frequency is 595kc below the mixer. The new I.F. frequency signal is amplified by two stages of pentode high gain 6BJ6 tubes. The output is now detected by a high permeance diode for minimum distortion and uniform detection. The received signal is then applied to the squelch control triode, noise limiter diode, 1st audio pentode and finally the 6GMS power output pentode to the speaker. The Beat Frequency Oscillator operates at 595kc  $\pm$  2kc and is capacitively coupled to the IF input to the detector.

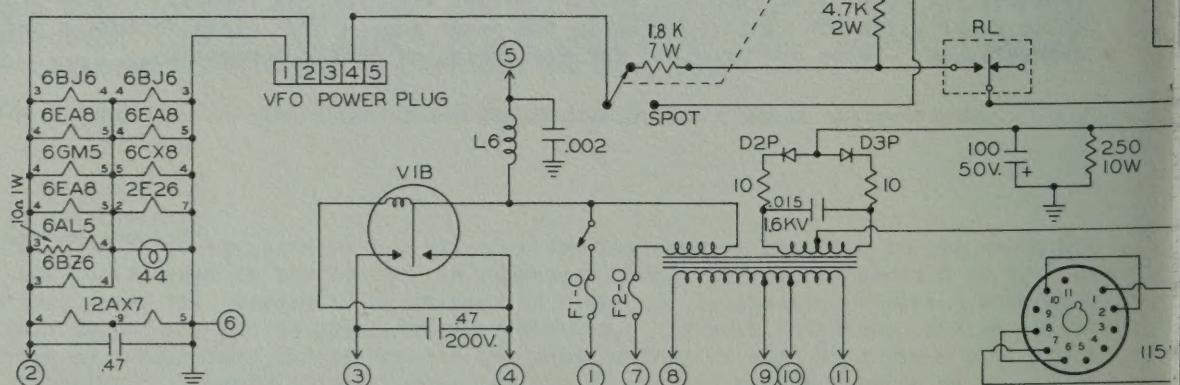
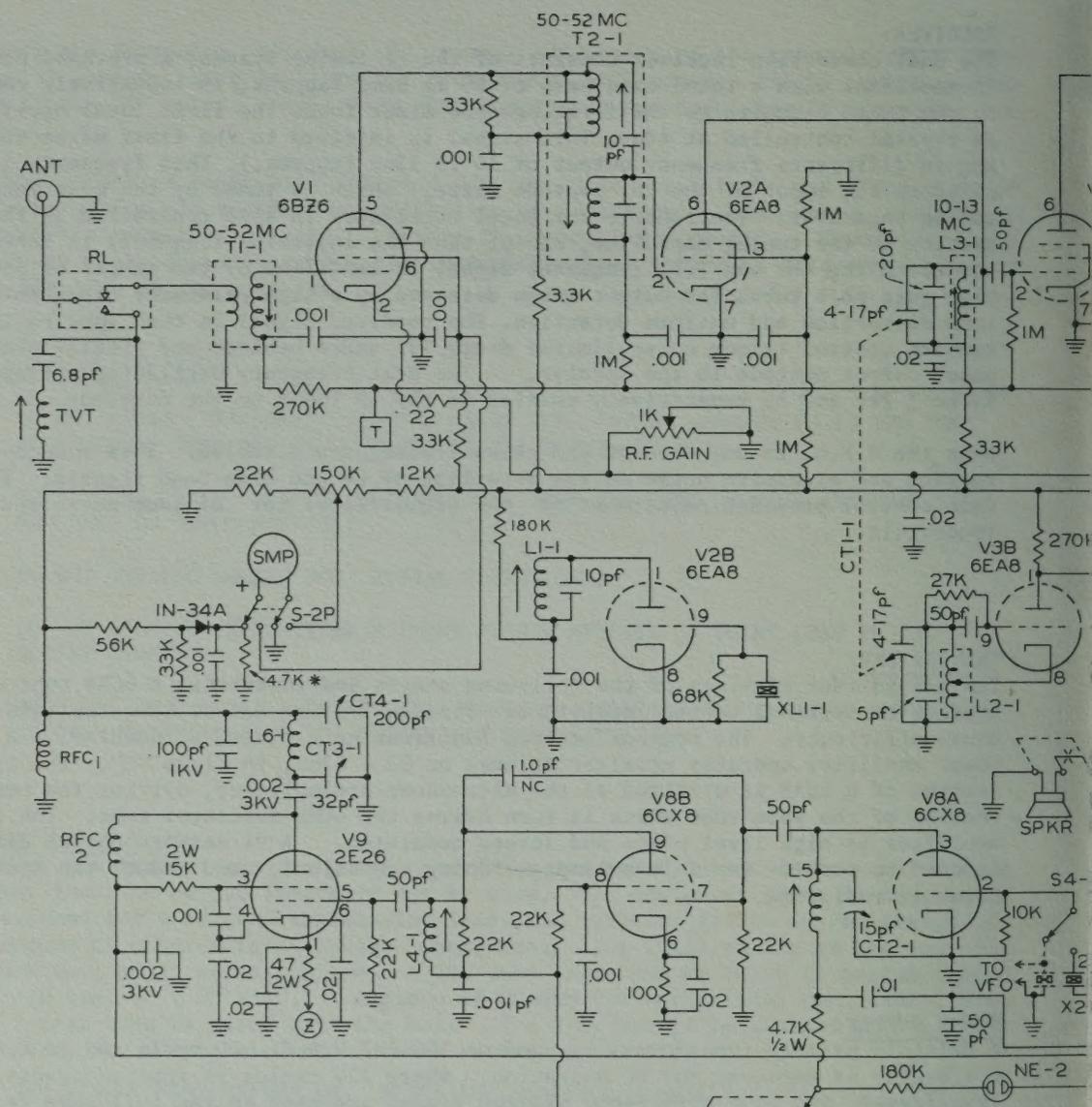
When the B.F.O. is on, the AVC and noise limiter are disabled. This reduces distortion and excessive noise during reception of CW and side band signals. The RF Gain control provides adjustment of the signal level for minimum noise and best readability.

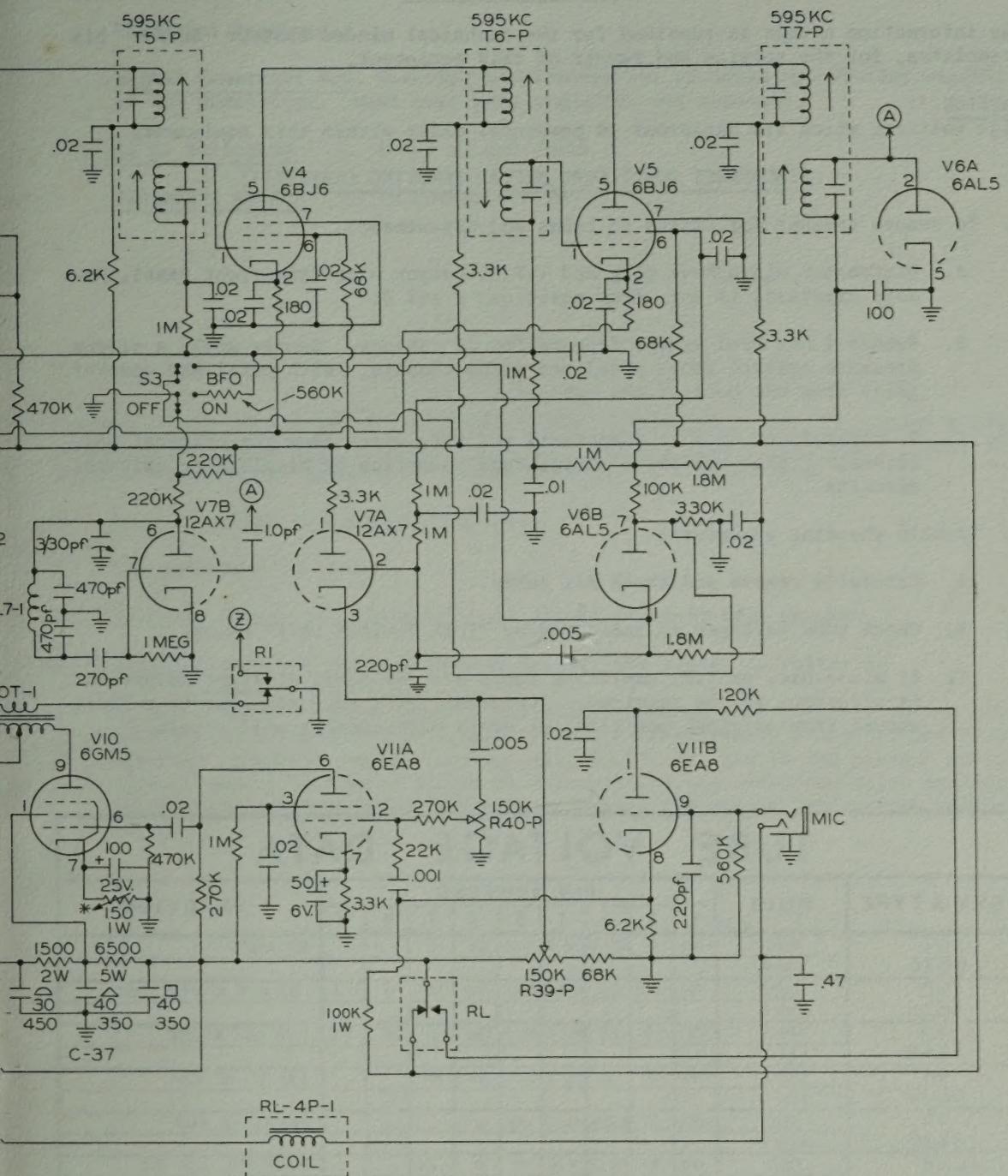
### TRANSMITTER:

The transmitter consists of the following stages and functions: A 6CX8 tube operates as an overtone crystal oscillator (triode) using 8.4 or 25mc crystals with equal efficiency. The pentode section functions as a class "B" doubler. A 2E26 power amplifier operates straight through on 50 - 52mc, in Class "C". The triode section of a 6EA8 is utilized as the microphone preamplifier, driving the pentode section of the same tube which in turn drives the 6GMS modulator tube. The final amplifier is high level plate and screen modulated. A Pi network output circuit is used to provide variable antenna matching provisions, and reduce the spurious harmonic radiation.

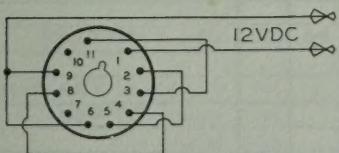
### POWER SUPPLY:

A multiple primary transformer is used on 105-120 V.A.C. 60 cycle and 12 V.D.C. A vibrator is employed for DC operation, where 120 cycles is applied across the transformer. Two high efficiency silicon diodes are used in the full wave rectifier circuit to provide uniform voltage output with various inputs. Hash and spike suppression are incorporated in the power supply for clean reception and transmission. Fuses are provided for protection of costly components.





DER LUG  
VIEW



SCHEMATIC DIAGRAM  
UTICA 650

## MAINTENANCE SECTION

The information herein is supplied for the technical minded amateur and/or his associates, for the service and repair of this equipment.

### **CAUTION!!!**

High voltages which are dangerous to personnel exist within this equipment.

DISCONNECT POWER CORD BEFORE REMOVING CABINET!!!

**1. To remove cabinet for access to tubes and adjustment:**

- A. Disconnect microphone plug and V.F.O. output plug from front panel. Remove crystals, if any, from positions 2 and 3.
- B. Remove 4 hex head screws from bottom of cabinet. Gently apply a slight pressure against front panel and slide chassis, with panel and speaker grill from the back of the cabinet.
- C. Be careful not to move components and R.F. wires from the original positions. This can cause substandard operation by misaligning critical circuits.

**2. Trouble shooting procedure:**

- A. Carefully remove and check all tubes.
- B. Check tube voltages as indicated by "TUBE VOLTAGE DATA" chart.
- C. If mixer-osc. or I.F. amplifier tubes are replaced, a slight adjustment in alignment may be required. Remember, only move adjustments a small amount from original position, or gross misalignment will result.

## TUBE VOLTAGE DATA

SYM & TYPE	MODE	PIN NUMBERS									FUNCTION
		1	2	3	4	5	6	7	8	9	
V1 6BZ6	REC	-.85	0	•12.6	•6.3	116	68	0			R.F. AMP
	XMIT										
V2 6EA8	REC	19	-.85	22	•12.6	•6.3	128	0	0	-.3	1ST MIX & XTAL OSC
	XMIT										
V3 6EA8	REC	13	-.9	28	•12.6	•6.3	128	0	0	-1.2	2ND MIX & OSC
	XMIT										
V4 6BJ6	REC	-.82	1.2	0	•6.3	120	66	0			595 KC I.F. AMP
	XMIT										
V5 6BJ6	REC	-.88	1.1	•12.6	•6.3	120	60	0			595 KC I.F. AMP
	XMIT										
V6 6AL5	REC	.08	-.24	•6.3	•10	0	0	0	-.24		2 ND DET. AVC NL
	XMIT										
V7 12AX7	REC	130	50	60	•12.6	0		52	-3.5	0	SQUELCH
	XMIT										BFO ON
V8 6CX8	REC										
	XMIT	0	-6	140	0	6.3	2	-2.5	96	190	OSC & DOUBLER
V9 2E26	REC										
	XMIT	5.6	•6.3	210	5.6	-30	5.6	0	0	310	CLASS C PWR. AMP.
V10 6GM5	REC	320			•12.6	•6.3	0	9.0		360	AUDIO OUTPUT
	XMIT	310			•12.6	•6.3	0	8.4		330	MODULATOR
VII 6EA8	REC	0	0	28	•6.3	0	50	1.4	7.8	0	1ST. AUDIO AMP
	XMIT	115	0	47	•6.3	0	85	2.3	4.0	0	MIC PRE AMP

READINGS TAKEN WITH V.T.V.M. FROM SOCKET PINS TO GND.

±10% OF SPECIFIED READINGS ARE ACCEPTABLE

• VOLTS A.C.

PROCEED AS FOLLOWS:

Equipment required:

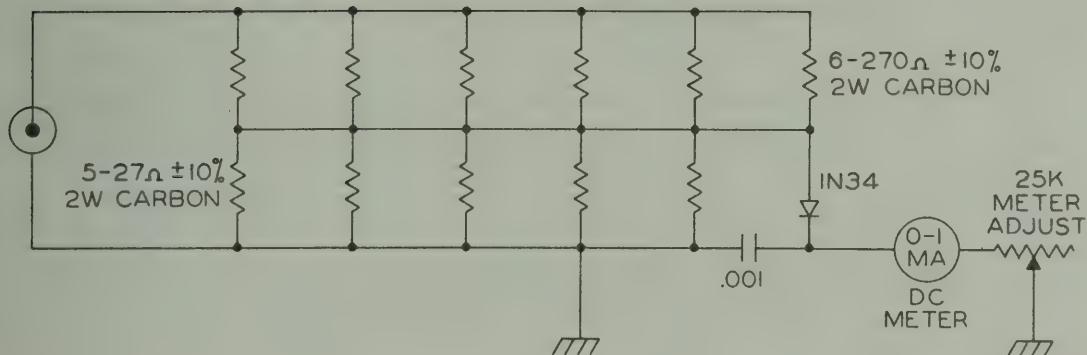
Signal Generator A.M. Covering the frequencies of 595kc and 49-53mc capable of 30% modulation. Must have good stability and accuracy.

A. C. Voltmeter      0-1.5 or 0-3 volts

Alignment Wrench      To fit coil cores

Connect output of signal generator to pin #2 of 2nd mixer tube, V3A, using a .002 capacitor in series with the generator lead. Connect the AC voltmeter across the chassis and external speaker connection (jumper) on chassis back.

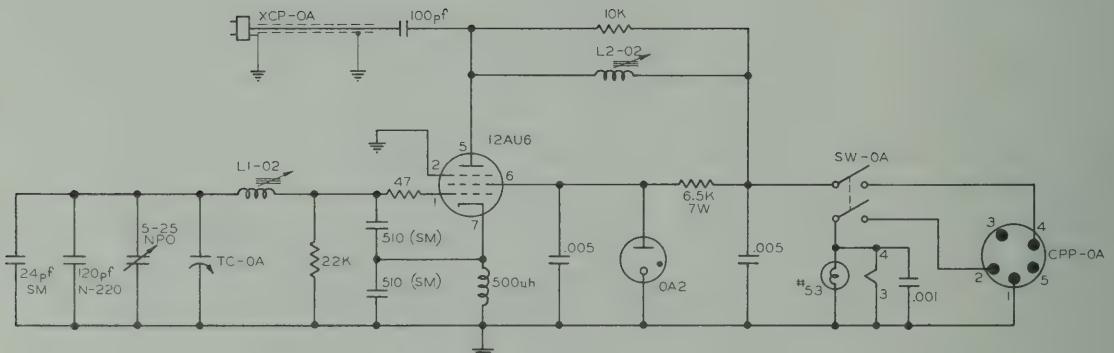
1. Turn on volume to maximum clockwise.
2. Set generator to 595kc.
3. Increase output of generator until signal is heard from speaker.
4. Slightly vary generator frequency for maximum signal on voltmeter.
5. Adjust generator output control for minimum output with receiver volume control set to produce a usable reading on the AC voltmeter scale, without overloading. Readjust top and bottom cores in T7, T6, and T5 for maximum indication. Reduce generator output to maintain initial reference meter reading. Retouch cores after first alignment to correct for slight interaction between stages.



DUMMY LOAD AND OUTPUT INDICATOR FOR TRANSMITTER TUNE - UP

6. The 40mc oscillator is checked by a DC V.T.V.M. applied to B+ of the coil L1-1. Remove the crystal from socket, and note a decrease in B+ voltage. Only a slight adjustment in the L1-1 core should be required to produce this condition.

7. Set Signal Generator to 50 mc. Feed signal into antenna connector and set output control to approximately maximum position. Set receiver dial to 50mc and slightly rock generator frequency dial above and below 50mc until signal is heard. Adjust oscillator trimmer on front section of main tuning capacitor to correlate the receiver calibration with the generator. Decrease generator output as required, to provide reference meter reading. Set generator and receiver dial to 51mc. Rock generator slightly, to receive signal. Adjust slightly cores in T2 and one core in T1 and L3 for maximum meter indication. Proper adjustment is made when 50, 51 and 52 mc signals are received with approximately the same sensitivity. Check for image by setting generator to 51 mc. Increase generator output, and tune receiver to approximate 52mc. This signal is the image and will be considerably less sensitive than the 51mc fundamental. Remove signal generator cable from Antenna Connector, and with BFO and Spot Switch "Off" adjust control at rear of chassis so that "S" meter pointer is set to center of 1st heavy mark on left edge of the scale.



V.F.O. SCHEMATIC UTICA "650 A"

## SUPPLEMENTARY INFORMATION

### MOBILE NOISE:

In any mobile installation, Voltage Regulator, Generator, and other motor noises are developed. It is extremely important that these noises be kept to a minimum for the ultimate in operation.

Listed below are a few of the more important precautions necessary to eliminate this difficulty. Additional information may be obtained by consulting any reputable Radio Handbook.

1. Be sure the unit is properly grounded to the body of the automobile. This can be accomplished through mounting to the dashboard or any other metal structure.
2. Make sure the coaxial cable shield is properly grounded to the connectors.
3. The power leads to the battery should be as short as possible. When the motor noise is a serious condition these leads should be shielded with tinned copper braiding, properly grounded at both ends.
4. The Noise Limiter threshold is factory adjusted for optimum rejection of impulse noise. Excessive ignition and power leak noise from other vehicles in operation is impractical to suppress without reducing the readability and quality of the receiver.

### ANTENNA LOADING:

In order to obtain maximum power transfer in either fixed or mobile operation it is necessary to achieve a low S.W.R., (1.2 to 1.0). A Power Output Meter or Field Strength Meter is recommended for the initial tune-up of the antenna. A 50-52 ohm (RG 58) transmission line is essential. The procedure listed below will aid in tuning the antenna.

1. Connect a Power Output Meter in series with the antenna transmission line or place a Field Strength Meter near the antenna for a sufficient reading.
2. Adjust the antenna load control and P.A. Tune for maximum reading.
3. Record the position of the Antenna Load Control for reference. Changing frequency will require only a slight adjustment of this control from the reference for optimum power output. When maximum loading occurs with the load control in full clockwise position the antenna system is low in impedance.

Additional information and methods of antenna matching may be obtained by consulting a Radio Handbook.

### V.F.O. OPERATION:

In V.F.O. operation, be sure to check your frequency with the Spot Switch. When spotting with V.F.O. more than one signal will be apparent on the receiver dial. Select the signal which is closest to the reading on the V.F.O. dial. This may be further checked by inserting a crystal of known frequency. Spot the crystal on the receiver dial. Now turn on V. F. O. and adjust dial until spot signal is received at the crystal frequency. Frequency drift of the V. F. O. is apparent before temperature stabilization occurs. Allow at least 30 minutes for warm up before operating.

Mis-handling in shipment could cause component shift, tube change, etc. Off frequency operation could thus be encountered.

## PARTS LIST

Wherever possible, standard parts are used throughout this equipment to provide the owner with easy access for replacement. However, special parts required in some areas are also included within this list.

### MODEL V-650 VFO

		METAL PARTS
L1-0A	Oscillator Coil	M1-0A Cabinet
L2-0A	Output Coil	M2-0A Chassis
CPP-0A	Input Power Cord & Plug	M3-0A Front Panel
XCP-0A	Output Cable & Plug	M4-0A Back Panel
TC-0A	Tuning Capacitor	KNL-0A Large Knob
DP-0A	Dial Plate	
PL-0A	Pilot Light #53	
RFC5-0A	500 uh RF Choke	
SW-0A	On-Off Switch	

### MODEL "650" TRANSMITTER-RECEIVER

<u>Transformers, Coils, Inductances</u>		<u>Disc Ceramic Capacitors</u>	
		<u>VALUE</u>	<u>QUAN. USED</u>
T1-1	50-52mc RF Transformer	6.8	1
T2-1	50-52mc Band-pass Transformer	.001	14
T5-P	595kc Input IF Transformer	.02	18
T6-P	595kc Interstage IF Transformer	100	2
T7-P	595kc Output IF Transformer	.005	2
L1-1	40mc Oscillator Coil	220	1
L2-1	2nd Local Oscillator Coil	50	4
L3-1	2nd Mixer Coil	.01	2
L4-1	Freq. Doubler Plate Coil	5	1
L5-1	Crystal Oscillator Plate Coil	.002	1
L6-1	P. A. Plate Tank Coil	.002	1
L7-1	B.F.O. Plate Coil	.002	1
TVT	TVI Trap Inductor	.002	6KV
RFC-1	47 uh RF Choke	.002	3KV
RFC-2	P. A. Plate RF Choke	120	1KV
OT-1	Modulation & Output Trans. (spec.)		
PT-1	Power Transformer (spec.)		
L6	Hash Filter Choke	.47	400V
		.5	400V

#### Variable Capacitors

CT1-1	Main Tuning Gang
CT2-1	Oscillator Tuning, 1.5 - 15 pf
CT3-1	P. A. Tuning & B.F.O. 3 - 32 pf
CT4-1	Antenna Load Tuning, (spec.)
TC-08	VFO Tuning Capacitor
5-25 pf	CV11A250

#### FP (Can Type) Capacitors

C-37	30-40-40-30/450-350-350-25v
C-38	10-100-50/100-25-6v

#### Mica Capacitors

<u>Value</u>	<u>Quantity Used</u>
5	1
470	2
270	1
1.0	2

#### Electrolytic (Tubular) Capacitor

100mfd 50V	1
------------	---

#### Resistors - Wirewound

250	10W	1
6.5K	5W	1
7K	10W	1
1.8K	7W	1

#### Resistors - Controls

1K	miniature	1
150K		3
150	1W	1

PARTS LIST, cont.

Resistors 1/2 Watt 10%

<u>Value</u>	<u>Quantity Used</u>
270K	4
22	1
33K	5
3.3K	5
1 Meg	13
470K	3
6.2K	2
180	2
68K	4
100K	1
330K	1
1.8 Meg	2
220K	3
27K	1
12K	1
22K	8
56K	1
100	1
18	1
4.7K	2
180K	1
10K	1
560K	2
10	2
120K	1
10K	1

Resistors 2 Watt 10%

15K	1
47	1
4.7K	1
1.5K	1

Resistors 1 Watt 10%

100K	1
------	---

Metal Parts

M1-0	Cabinet
M2-0	Chassis
M3-0	Front Panel
M4-0	Back Panel
M5-0	Speaker Grill
KNL-0	Large Knob
KNS-0	Small Knob

Miscellaneous

VIB	Vibrator (special) G 1532
XL1-1	40mc Crystal
SMP	Meter 0-1 ma F.S.
RL4-P	4 pole 26V coil relay
DP-0	Dial Plate
PL-0	Pilot Light #44
PLNE-0	Transmit Indicator
PP-0	Power Plug
TS	Speaker Terminal Board
S0239	Coax. Connector
J6-3	Microphone Jack
TS-0	Crystal Selector Switch
SW1-0	Meter Switch
SW2-0	Spot Switch
SW3-0	B.F.O. Switch
VPS-0	VFO Power Socket
F1-0	Fuse, 3AG 15 amp.
F2-0	Fuse, 3AG 2 amp.
D2P	Silicon Rectifier, BY-100
D3P	Silicon Rectifier, BY-100

Accessories

UW 115	Power Cord 115 VAC
UW 430	Power Cord 12 VDC
T350-C	Microphone

